

cells. However, this very thing was carefully avoided, and although it is somewhat difficult to get the pollen without getting wax at the same time, I am certain that there could not have been enough obtained in that way to give the percentage resulting, even when corrected for the oxidation which occurred.

As one would naturally expect, there was a large amount of water in this substance, 12.75 per cent. being obtained. The bulk of the remainder is protein, 64.4 per cent., not too high when we remember that pollen is mainly protoplasm. 9.23 per cent. of fat were found. A peculiarity of this fat is worth noting. It appeared to be made up of several oils, some of which were extremely volatile and had a very penetrating disagreeable odor. Both cane sugar and sucrose were present, the total sugar content being 9.5 per cent. of which 1.3 per cent. was cane sugar, and 8.2 per cent. sucrose. The wax would probably give between three and five per cent if a more accurate determination were made.

	Per Cent.	
Water	12.75	(Would vary with conditions.)
Protein	64.4	(Probably constant to a fraction of a per cent.)
Fat	9.23	(Probably constant to a fraction of a per cent.)
Sugar	9.00	(Would vary with the amount and kind of honey.)
Wax	3 to 5	(Probably fairly constant.)

It would be interesting to analyze several pollens and compare them with the above composite pollens. In fact for a standardization of pollen such a scheme would be necessary. Yet since the amounts of the different substances that go to make up protoplasm do not vary greatly it is a question whether a series of analyses of the different pollens would differ to any great extent from the above analysis of the mixed pollen.

SYRACUSE UNIVERSITY

TRAGOPOGON IN COLORADO

BY T. D. A. COCKERELL

Some years ago (1905) I noted that two species of *Tragopogon* were growing in Boulder, Colorado. Upon examination, they appeared to accord excellently with the two species credited to

our flora, *T. pratensis* L. and *T. porrifolius* L., and I accordingly paid no more attention to the matter. Later, I found a plant with intermediate characters, which was recorded as a hybrid between these species. This year I discovered that instead of two species, we had three; a second yellow-flowered form occurring in some abundance but quite locally on Tenth street. This caused me to collect a quantity of fresh material, which was described in detail. Having little European literature, I found it difficult to be sure of my species, and so sent particulars to Mr. Paul. C. Standley at the National Museum, requesting him to look in the European books. This he very kindly did, with the result of substantially confirming my guesses regarding the identity of the plants. *Tragopogon* as represented at Boulder may be described as follows:

TRAGOPOGON L.

Flowers purple; involucre bracts normally 8 to 10.

porrifolius L.

Flowers very pale purplish; involucre bracts 9 to 13.

porrifolius × *dubius*.

Flowers chrome yellow; involucre bracts 8; leaves twisted.

pratensis tortilis Pritz.

Flowers lemon yellow; involucre bracts 13, rarely 8; leaves straight. *dubius* Scopoli.

Tragopogon porrifolius L.

Corolla purple; stigma purple; anthers black, ochreous marginal lines faint or absent; involucre bracts 8 or 10 in a head, 8 is the commoner number, one plant had heads with 8 and heads with 10; bracts entirely green, extending about 10 mm. beyond ends of lateral corollas; tips of pappus purple, subapical hairs pale brown; fruiting heads broad at base, the stem below strongly, not abruptly, swollen; foliage normal, leaves straight. Very abundant.

***Tragopogon porrifolius* × *dubius* hyb. nov.**

Corolla very pale purplish; stigma pale grey; involucre bracts 9 or 13, extending about 9 mm. beyond lateral corollas; pappus

pale; foliage normal. Scattered plants, where *porrifolius* and *dubius* grow together. A plant I watched for seed proved entirely sterile.

Tragopogon dubius Scopoli

Corolla clear lemon yellow; stigma gray or blackish; anthers black, with ochreous marginal line; involucre bracts normally 13, but 8 in smaller plants; bracts entirely green, extending about 10 mm. beyond lateral corollas; tips of pappus and subapical hairs very pale brownish, not at all purple; fruiting heads not greatly broadened at base, but stem below greatly, but not at all abruptly, swollen; achenes very strongly tuberculate; foliage normal, the leaves straight. The heads are about 2½ inches broad when well developed. Abundant.

Mr. Standley, after seeing a head and my notes, wrote: "seems to be known in Europe as *Tragopogon pratensis minor* Fries. Probably this is the same as *dubius* Scop., at least so far as one can tell from the descriptions. Some authors cite the two as synonyms." My plant agrees very closely with the description of *T. dubius* in Wilczek and Schinz, *Flore de la Suisse* (1909), p. 629. The only discrepancy is in the number of bracts, which these authors give as 10 to 12.

Tragopogon pratensis tortilis Pritz*

Corolla chrome yellow (dandelion yellow); stigma clear pale orange; anthers black on outer side except at base, with ochreous marginal line; involucre bracts constantly 8; outer bracts with very conspicuous purple margins; bracts not extending beyond corollas; pappus colored as in *dubius*; fruiting heads very broad at base, but stem below little swollen; margins of leaves crinkled, wavy (but straight when flattened out), ends of leaves much curled, many of them corkscrew-like.

Mr. Standley says that this is *T. pratensis tortilis* Pritz, of which *T. undulatus* Reichenb. and *T. pratensis undulatus* Thuill. are synonyms. The *Index Kewensis* gives *T. tortilis* Pritz, *l.c.* *Ind.* ii, 275, and *T. undulatus* Thuill., *Fl. Par.* ed. II, 396 (not *undulatus* Jacq.); both as synonyms of *pratensis*.

* Since this was written I have (Aug. 1912) found *tortilis* in a garden at Santa Fé, N. Mex.

Later, Mrs. L. A. Moore brought me a number of heads from the other side of Boulder, which proved to be as follows:

- (1) *T. dubius*; normal, but with 12 involucre bracts, going 10 mm. beyond corollas.
- (2) *T. porrifolius*; normal, with 8 bracts.
- (3) *T. porrifolius*, variety. Flowers pale lilac; 8 involucre bracts. Two specimens, in one the bracts going 5 mm. beyond flowers, in the other only as far as ends of corollas.
- (4) *T. porrifolius*, variety. Flowers pale lilac as in 3, but rays very short, the total length of corollas of outer florets about 23 mm. The bracts, 10 in number, go about 17 mm. beyond corollas.

Are numbers 3 and 4 F_2 hybrids from *dubius* \times *porrifolius*? I cannot now find any typical *T. pratensis* in Boulder.

REVIEWS

Halls' Yosemite Flora*

Among the large number of books on out-of-door life we have seen none as attractive or as serviceable in make up as Professor and Mrs. Hall's "Yosemite Flora." The pigskin cover, the natural colored paper and the pocket size make it an almost irresistible companion to one interested in the wonderful flora display of Yosemite. Indeed the authors and their publishers have set a new standard which writers of popular books on natural history may well emulate.

Nor is the pleasing appearance the only virtue of the new flora. A casual thumbing of the pages discloses several half-tone plates illustrating some of the floral attractions of the park and many well-drawn text figures that greatly enhance its value. An introductory chapter discusses in a very readable style the general floral features and life zones of the region. Another chapter gives clear concise directions to the novice in the use of the keys and explanations of the botanical terms.

From the preface we learn that nine hundred and forty-five

* Hall, Harvey Monroe, and Carlotta Case. A Yosemite Flora. Pp. vii+282. Paul Elder & Company, San Francisco. 1912. \$2.00.